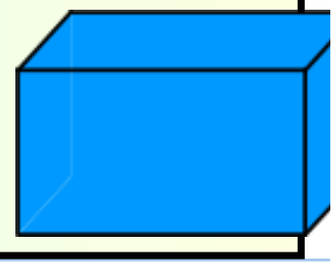
(6) M - Recall and use the equation for pressure
(7) S - Deriving the equation for pressure in a fluid
(8) C - State and apply Archemedes principle to problems involving pressure

Lesson 9. Pressure

S
A

STARTER: A rectangular block with dimensions 6.0 cm by 8.0cm by 12.0cm is made of aluminium of density 2700 $kg\,m^{-3}$.

Find the maximum pressure it can exert when placed on one of its faces on a horizontal surface. (*3 marks*)



P

(6) M - Recall and use the equation for pressure
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0:05:00

ACTIVITY 1: Why do fluids exert a pressure on a surface?

Due to the weight of water above that point acting over a surface.

[redacted]

You can calculate the pressure exerted by a vertical column of any liquid from its weight and cross sectional area.

$\rho = \frac{M}{V}$

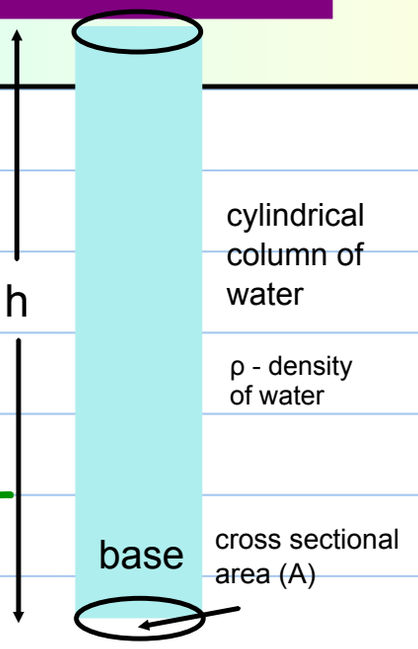
$m = \rho V$

$p = \frac{F}{A} = \frac{mg}{A}$

$= \frac{\rho V g}{A}$ hA

$= \frac{\rho h A g}{A}$

$= h\rho g$



$p = h\rho g$ [redacted]

Calculate the total pressure acting on the submarine at a depth of 0.8km.

Density of sea water = 1.03×10^3 kgm-3

Ex: Why is this not the true value?

Atmospheric pressure = 101 kPa 1.01×10^5 Pa +

[redacted]

8.08×10^6 Pa.

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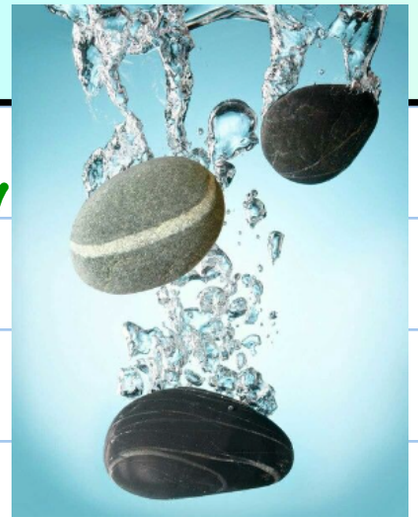
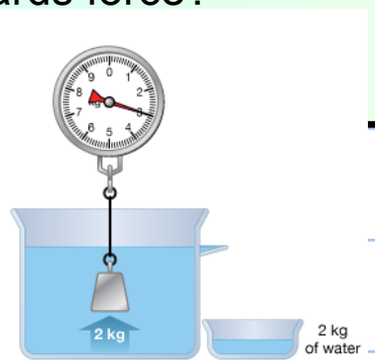
0:05:00

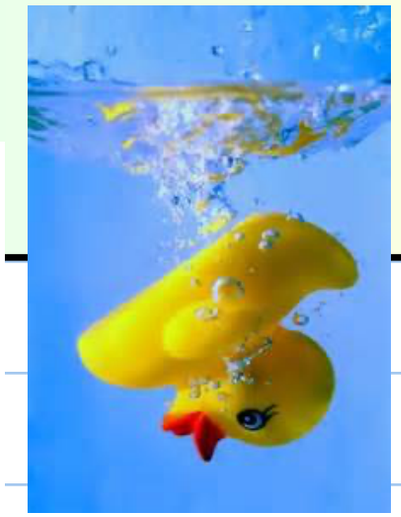
ACTIVITY 2: What are the forces acting on this duck (at max depth)?

- Sketch them.
- What is the reason for the upwards force?

T.V

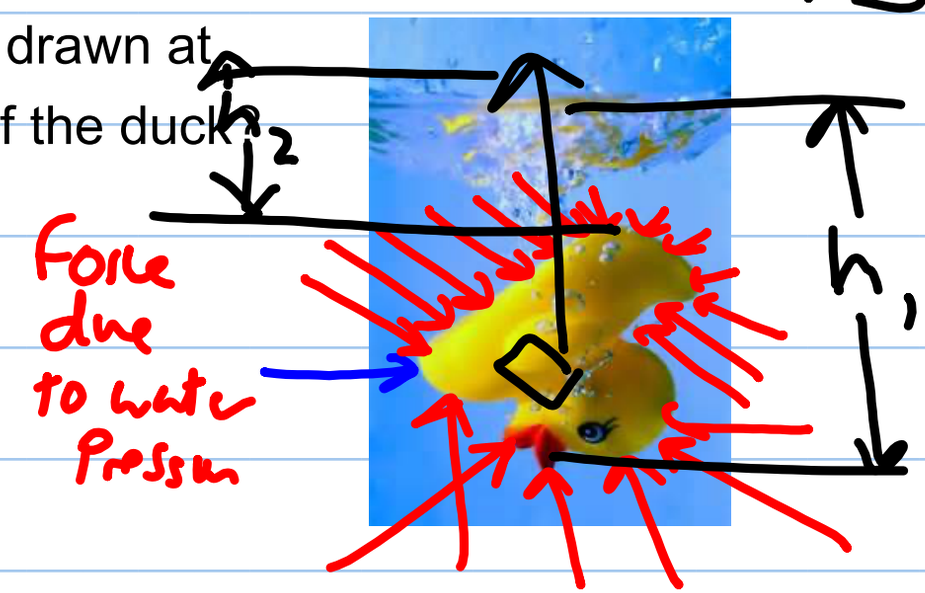






$F = PA$ □ $P = h\rho g$

How do the force change if drawn at each point on the surface of the duck?



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Archimedes' principle:

The **upthrust** exerted on a body in a fluid, whether partially or fully submerged is equal to the weight of fluid that body displaces.

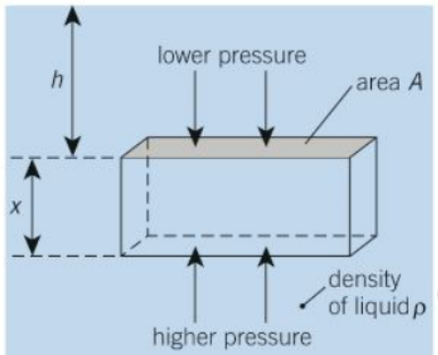
Ex: Task: Show the above statement is true by using algebra

$$p = h\rho g$$

1. Find an expression for the force from above

2. Find an expression for the force from below.

3. Find the difference in force. this is the **upthrust**



Ex: Does this idea make sense for an irregular object? Explain your answer.

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ACTIVITY 3:
Complete the summary question on page 69.

Deep water divers p69

Kilo 10^3

Mega 10^6 Complete the barometers extension worksheet instead.

Giga 10^9

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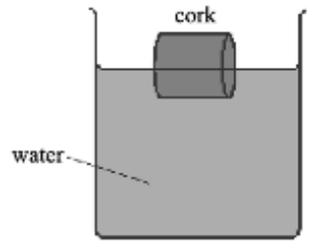
0:05:00

A bottle cork floats on water. It is partially submerged in the water.



Which of the following statements is / are true?

1. The net force acting on the cork is equal to the weight of the water displaced.
2. The weight of the cork is equal to the upthrust on the cork.
3. The upthrust on the cork is equal to the mass of the water displaced.

A. 1, 2 and 3
B. Only 2 and 3
C. Only 3
D. Only 2

D